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# A Lexicon of Peanut Flavor Descriptors //

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## ABSTRACT

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This publication presents a lexicon of 19 terms to describe desirable as well as undesirable flavors in peanuts. The terms, or descriptors, are to be used with flavor intensity ratings ranging from 0 to 10 in flavor evaluations of peanut kernels and butters. The lexicon and intensity scale were developed by a 13-member panel of flavor and peanut specialists representing industry and the U.S. Department of Agriculture.

**KEYWORDS:** peanuts, taste, flavor, off-flavor, sensory description.

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# A LEXICON OF PEANUT FLAVOR DESCRIPTORS //

By Peter B. Johnsen<sup>1</sup>

## Introduction

Recently, factors which limit the efficiency of production, quality, and utilization of U.S. produced peanuts were the subject of a workshop sponsored by the U.S. Department of Agriculture's Agricultural Research Service (ARS). Participants at this July 1984 workshop included representatives of producers, shellers/handlers, and processors, in addition to ARS, State, and industry scientists. At the conclusion of the workshop, the participants identified, by consensus, researchable problems which are critical to the future of the U.S. peanut industry.

One of the high priority problems identified was "off-flavor" in peanuts and peanut products. The National Peanut Council has expressed to ARS its concern over reports of unacceptable flavors in peanuts, and ARS has responded by establishing quality/flavor research programs at its Southern Regional Research Center (SRRC) and National Peanut Research Laboratory (NPRL). Work at SRRC has centered on chemically analyzing peanut constituents to determine their relationship to flavors, while work at the NPRL has been oriented toward defining cultural variables that would affect quality/flavor. However, before further work investigating the causes of off-flavors can proceed, a common standardized vocabulary is needed to describe both desired and unacceptable flavors in peanuts and peanut products. Once this vocabulary or lexicon has been established, trained taste panels can complement the work of peanut specialists in determining the biological, physical, and chemical causes of unacceptable flavors which occasionally arise in the peanut industry.

To this end, SRRC contracted with the Monell Chemical Senses Center (MCSC) to organize a meeting of flavor specialists to derive, by

consensus, a list of terms for describing both typical and problem flavor characteristics of peanuts.

## Participation

Under the aegis of the Monell Chemical Senses Center, the meeting convened in New Orleans at the Southern Regional Research Center during February 1986. Sensory consultant Gail Vance Civile (Sensory Spectrum, Inc.) led a panel of 13 flavor and peanut specialists in the development of the peanut flavor lexicon. Industry representatives included Suzanne Whitlock (Hershey Foods Corp.), Margaret Twomey (Hershey Chocolate Co.), Fredrick Smith (Snack-Masters, Division of M&M/Mars), Karen Huether (Nabisco Brands, Planters Peanut Co.), Judy Heylmun (Nabisco Brands, Inc.), Lisa Thompson (CPC-Best Foods), Martha Holland (Azar Nut Co.), Karen Carter (Beatrice Grocery Group) and Art Schmidt (The Procter and Gamble Co.). ARS panel members included Carolyn Vinnett (SRRC), John Vercellotti (SRRC), Jack Pearson (NPRL), and Tim Sanders (NPRL). Observers at the panel meeting included Melanie Miller, Lee Jones, Jim Leek, Ron Henning, and Howard Valentine, representing the National Peanut Council, and Wilda Martinez and Ivan Kirk of ARS.

## Acquisition of Peanut Samples

On October 29, 1985, a general outline of the flavor lexicon project was presented to the National Peanut Council's Research Committee. At that time, the committee was asked for samples of medium runners with both problem and preferred flavors. This request was followed by an announcement in the November issue of the Peanut News describing the project and requesting raw peanut samples.

Only five samples were obtained via this approach. This low return was due primarily to the industry's practice of maintaining samples in-house for only 30 to 90 days. Because recent peanut crops have had limited flavor problems, off-flavor samples were generally unavailable. Following consultation with members of the

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National Peanut Council's Research Committee, additional samples were obtained through the NPRL from a variety of sources. Screening of 23 purported off-flavor samples by Johnsen, Civile, Vercellotti, Sanders, and Pearson led to the selection of 10 samples with distinct flavor variations representing a range of some commonly encountered off-flavors.

### Sample Preparation

Peanut samples were roasted to an approximate standard color so that variations due to roasting duration and temperature could be eliminated in this study as well as in future studies using the developed flavor lexicon. Table 1 gives some pertinent information about the samples both as kernels and butters. Following roasting and blanching, butter samples (unstabilized peanut slurries without added salt, sweeteners, emulsifiers, and stabilizers) were prepared in either a Bauer Brothers mill or a food processor. All samples were refrigerated until the panel meeting.

### Sample Presentation

Peanut samples were presented to panel members in the form of approximately 12 blanched splits and/or 10 grams of butter. All samples were allowed to warm to room temperature before tasting and were assigned different, random three-digit codes at each presentation to limit sample identification. Rinse water was nonchlorinated commercial spring water served at room temperature.

### Development of the Lexicon

The first step of this project was to compile a preliminary list of flavor terms which characterize the aromatics or notes perceived by the olfactory nerve of products in the oral cavity, tastes, the notes perceived by taste buds in the oral cavity, and chemical feeling factors such as astringency, chemical heat (like peppers), and chemical cooling (like menthol)

perceived by the trigeminal nerve in the oral cavity of a reference sample which was a typical roast of medium size runner peanuts. To enhance the robustness of this list, reference samples at four other roast levels ranging from very underroasted to very overroasted were presented to the panel as well. From these five samples the preliminary vocabulary was developed and then discussed; next a specific definition for each term was established so that all panel members could use the same terms to describe any given flavor.

To rate the intensities of peanut flavors, a 10-point scale was developed. This scale was established in reference to flavor intensities the panel assigned to commercially available foods. The panel agreed that the intensity of the "roasted peanutty" flavor note of the reference sample rated 6.5 on the scale.

<u>Scale</u>	<u>Intensity reference</u>
0	None
1	
2	Soda in a saltine cracker
3	
4	Apple in Motts applesauce
5	
6	Orange in Minute Maid orange juice
6.5	<u>Roast peanutty</u>
7	
8	Grape in Welch's grape juice
9	
10	Cinnamon in a Big Red gum

To become more familiar with the flavor terms and intensity scale, the panel evaluated 50:50 mixes of the different roasts. This exercise demonstrated that the intensities of specific flavor notes persisted in mixes and were not averaged by blending.

After developing the preliminary lexicon and the intensity rating scale for the typical peanut character, that is, the aromatics, tastes, and

Table 1.  
Roasting conditions<sup>1</sup> and color data<sup>2</sup> for peanut samples

Sample	Description	Size	Roast temp. (°F)	Roast time (min)	Hunter color of roasted and blanched kernels			Butter color			Nearest USDA std
					L	a	b	Hunter			
								L	a	b	
1	Off-flavor	Medium	320	37.5	50.9	8.7	20.3	47.4	11.1	22.7	3
2	Off-flavor	O.E.	320	26	50.5	8.4	19.3	48.4	10.8	22.9	3
3	Off-flavor	No. 1	320	29	49.6	7.9	19.8	47.9	10.5	23.0	3
4	Off-flavor	Medium	320	37	48.1	10.3	20.6	47.0	11.4	23.0	3
5	Off-flavor	Medium	320	38	49.1	7.2	20.8	47.7	11.1	23.1	3
6	Off-flavor	No. 1	320	26	49.8	8.2	19.6	47.6	11.1	23.1	3
7	Off-flavor	Medium	320	34	46.8	9.5	18.8	42.3	12.5	21.6	4
8	Off-flavor	Medium	320	31	50.2	8.5	19.9	48.9	10.6	22.6	3
9	Off-flavor	Medium	320	37	45.4	9.9	18.5	40.9	13.0	21.2	4
10	Off-flavor	Medium	325	12.5	--	--	--	--	--	--	--
11	Rancid butter	Medium	325	12.5	53.0	6.9	19.8	50.7	8.0	23.3	3
12	Very light-roast	Medium	325	7.5	59.8	3.3	19.0	59.0	4.0	20.8	2
13	Light-roast	Medium	325	10	56.5	5.3	19.5	53.7	7.3	22.4	3
14	Reference	Medium	325	12.5	53.0	6.9	19.8	49.2	9.7	22.7	3
15	Dark-roast	Medium	325	15	52.5	7.4	19.7	45.8	11.0	22.3	3
16	Very dark-roast	Medium	325	17	49.7	8.0	14.4	40.8	12.6	21.2	4

<sup>1</sup>The U.S. Department of Agriculture (USDA), Agricultural Research Service's Southern Regional Research Center and National Peanut Research Laboratory prepared the samples using different conditions (sample sizes and roasting durations, temperatures, airflow rates, and equipment). The color data for samples 1-9 are therefore not directly comparable to those for samples 10-16.

<sup>2</sup>Color data were obtained with a Hunter Lab color meter (model P25-PC2) and by visual comparison with the USDA color standards for peanut butter.

feeling factors associated with medium runners with no off-flavors, the panel was offered 10 samples which represented off-flavors. Additional flavor descriptors from these samples were then added to the lexicon. A further discussion of terms led the panel to refine the specific flavor descriptors for both the typical and off-flavor peanut samples and to establish the following current lexicon of peanut flavor descriptors.

## Lexicon of Peanut Flavor Descriptors

### Aromatics

#### Roasted peanutty

The aromatic associated with medium-roast peanuts (about 3-4 on USDA color chips) and having fragrant character such as methylpyrazine notes.

#### Raw bean/peanut

The aromatic associated with light-roast peanuts (about 1 or 2 on USDA color chips) and having legumelike character (specify beans or pea if possible).

#### Dark roasted peanut

The aromatic associated with dark-roast peanuts (4+ on USDA color chips) and having very browned or toasted character.

#### Sweet aromatic

The aromatic associated with sweet material such as caramel, vanilla, molasses, fruit (specify type).

#### Woody/hulls/skins

The aromatics associated with base peanut character (absence of fragrant top notes) and related to dry wood, peanut hulls, and skins.

#### Cardboard

The aromatic associated with somewhat oxidized fats and oils and reminiscent of cardboard.

#### Painty

The aromatic associated with linseed oil/oil based paint.

#### Burnt

The aromatic associated with very dark roast, burnt starches, and carbohydrates (burnt toast or espresso coffee).

#### Green

The aromatic associated with uncooked vegetables/grass/twigs, cis-3-hexenal.

#### Earthy

The aromatic associated with wet dirt and mulch.

#### Grainy

The aromatic associated with raw grain (bran, starch, corn, sorghum).

#### Fishy

The aromatic associated with trimethylamine, cod liver oil, or old fish.

#### Chemical/plastic

The aromatic associated with plastic and burnt plastics.

#### Skunky/mercaptan

The aromatic associated with sulfur compounds, such as mercaptan, which exhibit skunklike or rubberlike character.

### Tastes

#### Sweet

The taste on the tongue associated with sugars.

#### Sour

The taste on the tongue associated with acids.

#### Salty

The taste on the tongue associated with sodium ions.

#### Bitter

The taste on the tongue associated with bitter agents such as caffeine or quinine.

### Chemical feeling factors

#### Astringent

The chemical feeling factor on the tongue, described as puckering/dry and associated with tannins or alum.

#### Metallic

The chemical feeling factor on the tongue described as flat, metallic and associated with iron and copper.



## Validation of the Lexicon

To validate the flavor terms and definitions, the panelists were asked to evaluate four pairs of samples, each pair comprising a reference sample and an off-flavor sample. In these tests, the panel was able to distinguish between the reference and off-flavor samples and to describe them in terms of the vocabulary and intensity scale it had developed. Data collected from these evaluations are presented in table 2. However, it should be pointed out that these data should not be interpreted as constituting a definitive flavor description of the specific samples. They are intended only to confirm the appropriateness of flavor terms used to describe the typical and off-flavor samples.

## Conclusions

The peanut flavor terminology and definitions that were developed are comprehensive yet nonredundant and should be highly useful among

individuals who need to evaluate and communicate flavor characteristics (aromatics, tastes, and feeling factors) of peanuts and peanut butter. The level of expertise and support from the contributing members of this panel, along with the consistency of the data collected in the final comparisons of coded samples, substantiate the potential for using these terms to describe a wide array of peanut flavors.

While this lexicon is comprehensive, it is most probably incomplete. As samples with off-flavors are encountered, they should be evaluated according to this vocabulary and the lexicon continually expanded as necessary.

Table 2.  
Intensities of flavor characteristics as rated for peanut samples tested in pairs<sup>1</sup>

Flavor characteristic	Reference X±S.D.	Off-flavor X±S.D.	Reference X±S.D.	Off-flavor X±S.D.	Reference X±S.D.	Off-flavor X±S.D.	Reference X±S.D.	Off-flavor X±S.D.
Roasted peanutty	6.1±0.6	2.7±1.6	5.3±1.2	2.1±1.3	5.2±1.6	2.7±1.7	4.7±1.7	1.1±1.3
Raw bean	1.7±1.0	1.4±1.3	2.0±0.9	1.9±2.3	1.3±0.9	3.7±2.2	1.8±1.3	0.2±0.6
Dark roast	2.1±1.3	1.3±1.7	1.7±1.3	1.6±1.9	2.2±1.0	0.5±0.8	1.5±1.3	2.2±2.6
Sweet aromatic	3.5±1.3	1.3±1.5	3.2±0.6	0.5±1.1	2.7±1.5	2.3±1.4	3.0±1.3	0.7±1.0
Woody/hulk/skins	1.2±1.2	2.1±1.8	1.5±1.2	1.5±1.4	1.0±0.8	1.7±1.5	0.7±0.8	--
Cardboard	--	3.4±2.7	(3)	(3)	--	--	--	--
Painty	--	4.7±1.8	--	2.8±3.0	--	--	--	--
Burnt	(2)	--	(2)	--	(1)	--	(3)	2.7±3.2
Green	(1)	--	(1)	--	1.5±1.5	--	--	--
Earthy	(1)	--	--	--	(3)	--	--	--
Fishy	(3)	--	--	--	--	--	--	--
Grainy	(1)	--	(1)	--	(2)	--	--	--
Chemical/plastic	(5)	--	5.6±1.4	--	--	1.9±1.0	0.3±0.8	--
Sweet	2.9±0.9	1.4±1.2	3.0±0.8	1.5±1.3	2.1±1.1	2.4±1.3	--	(5)
Sour	0.2±0.4	(3)	(1)	--	--	(1)	--	(1)
Bitter	1.2±1.3	2.0±1.8	1.8±1.3	2.7±1.5	1.2±0.9	1.6±1.5	1.6±1.7	2.2±2.0
Salty	(2)	(2)	--	--	(2)	--	--	--
Astringent	1.6±1.2	2.0±1.4	1.8±1.5	2.2±1.9	1.6±1.0	1.5±1.5	1.9±1.4	2.3±1.6
Metallic	--	--	--	--	--	--	--	--

<sup>1</sup>Values are mean and standard deviations of 13 individual judgments.  
Numbers in parentheses indicate frequency of observations. Absence of response indicates characteristics not noted.

